

Some Responses by Members of the *Marsileaceae* Grown Under Field Conditions

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It is generally known that the members of the genus *Marsilea* exhibit sleep movements (1, 2). During the past two summers observations have been made of members of the *Marsileaceae* grown under conditions approximating their natural habitats. In the course of these observations, several other phenomena which appear to be associated with the same mechanism responsible for sleep movements have been noted. This paper will be a preliminary report on these observations to date.

During the summer of 1965, plants of *Marsilea Drummondii* were transplanted to a tub filled with soil to within two inches of its rim. The tub was placed out of doors in an open area where it received very little shade. From time to time water was added. During a chance observation in the middle of the afternoon it was noted that all the leaves were exposed in such a way as to present the plane of the opened leaf blades at a right angle to the sun's rays. Following this observation, further observations were made throughout the day. Early morning observations showed the leaves to be open and facing the rising sun. During the course of the day the leaves were observed to turn so as to present at all times their upper surface at right angles to the sun's rays, and to close in the evening while still facing the direction in which the sun had set.

Methods and Materials

During the summer of 1966, large galvanized tubs were partially buried in a field on the East Campus of Valparaiso University and the tubs filled to within a few inches of the rim with a rich loam soil from the field. The soil in each tub was saturated with water and eleven different species of the genus *Marsilea* and *Regnellidium diphyllum* were transplanted, one each, into the tubs. The tubs were watered to the brim about once a week early in the summer and later permitted to dry to induce sporocarp formation.

Results

Observations were made throughout the day to determine if all the species being cultivated showed the type of movements observed earlier. All the species of *Marsilea* showed such movements but it was noted that some species assumed a more extreme position in the early morning and late afternoon. In these species the plane of the open leaf was in an almost vertical position at these times. *Regnellidium* showed no such movements.

All the species of the genus *Marsilea* showed the characteristic sleep movements reported for the group. However, *Regnellidium* did not show sleep movements. Efforts were made to determine whether the sleep movements were of a rhythmic or time-controlled nature or

whether they were controlled by the light stimulus. Various tub cultures were covered by an inverted tub at various times during the day and the plants observed after some time. Whenever *Marsilea* plants were covered, the leaves soon assumed the sleep position. Plants were also illuminated during the night. When the lights were turned on during the night after sleep positions had been established, the leaves returned to the open position. When the light was turned on prior to sunset, the leaves did not close.

When water was withheld from the plants to the point at which wilting occurred, the members of the genus *Marsilea* exhibit modified sleep movements. *Regnellidium* plants do not show such wilting movements.

Discussion

Since movements following the sun, sleep movements, and modified sleep movements with wilting are either all present as in the *Marsilea* or all absent as in *Regnellidium*, it would appear probable that the same mechanism is involved in all three responses. These observations in addition to the known facts concerning similar responses in other plant species would suggest that turgor pressures are at least partially responsible for these movements. Studies are in progress to determine the light action spectrum and the anatomical structures involved in these movements.

Literature Cited

1. EAMES, ARTHUR J. 1936. **Morphology of Vascular Plants**. McGraw-Hill Book Co., Inc., New York.
2. WALLACE, RAYMOND H. 1931. Studies on the Sensitivity of *Mimosa pudica* L. The effect of certain animal anesthetics upon sleep movements. *Am. Jour. Bot.* **18**(2):102-111.